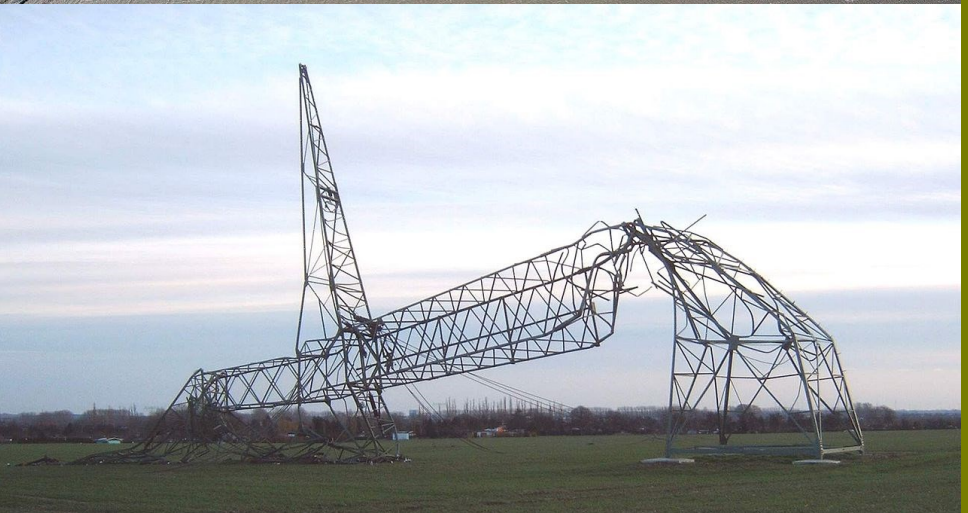

International threats and opportunities of climate change to the Netherlands

Jelle van Minnen
(Marijke Vonk, Hans Eerens, Willem Ligtvoet, Louise van Schaik, Arno Bouwman, Rob van Dorland..)

Workshop
Indirect International Impacts of Climate Change
26 & 27 September 2017, Zurich

2 dimensions

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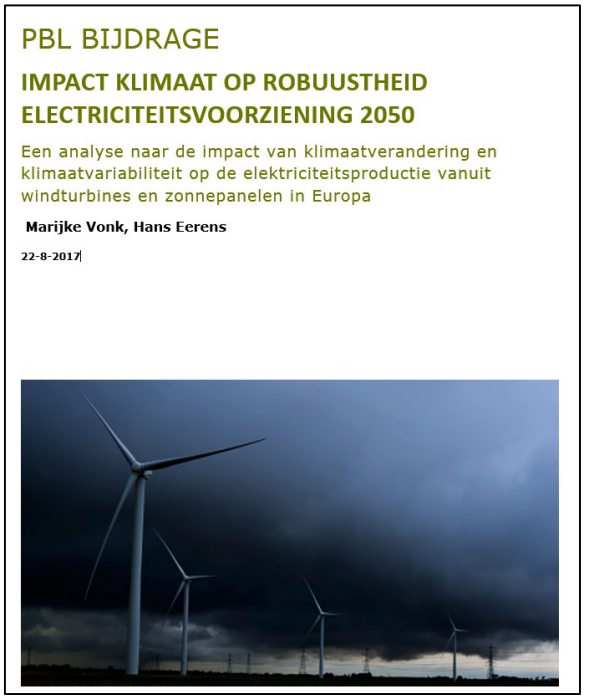
- Exploration of risks and opportunities of the changing climate elsewhere on the Netherlands (2014 & 2015)
  - Building Block Dutch National Adaptation Strategy
  - Thoughts adaptation options: how to reduce risks & seize opportunities
- Stresstest of the Dutch electricity system for climate change & variability in Europe (2017)



4 elements

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Considered 4 elements risks & opportunities

- Disruptions of trade chains & supply of raw materials
- Health (& Tourism)
- Vital networks
- Political tensions/security

Why relevant

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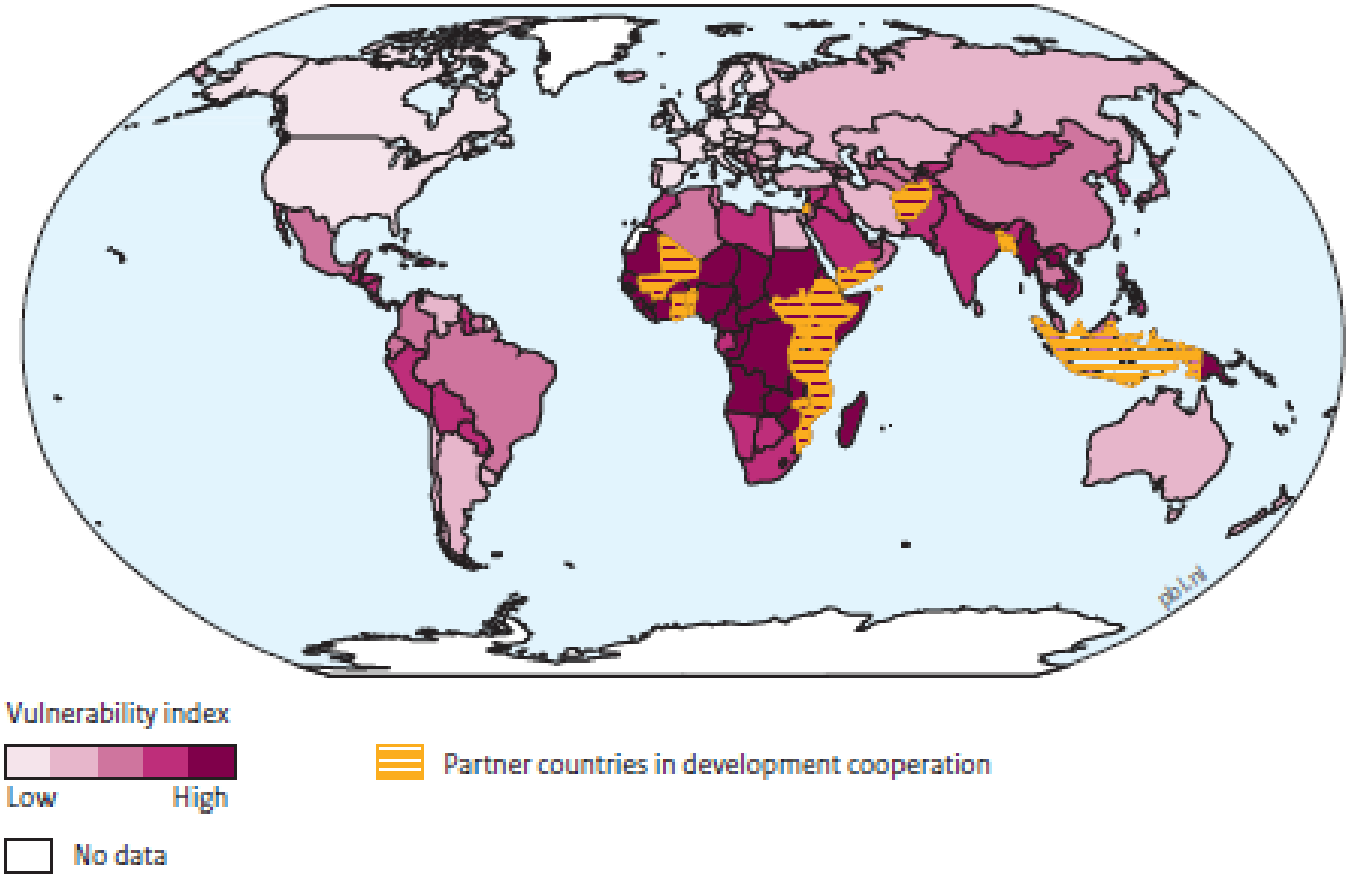
Many places in the world are (more) vulnerable to climate change

Figure 2.5

Climate change vulnerability, 2012



Why relevant (ii)

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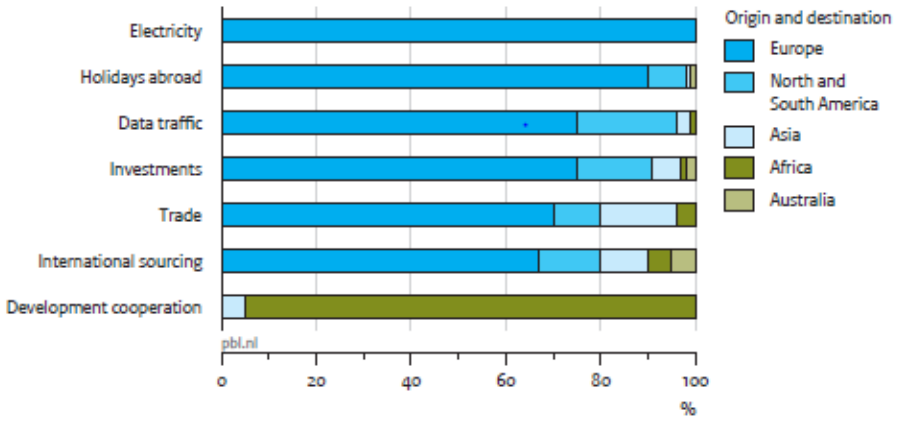
Open Dutch Society:

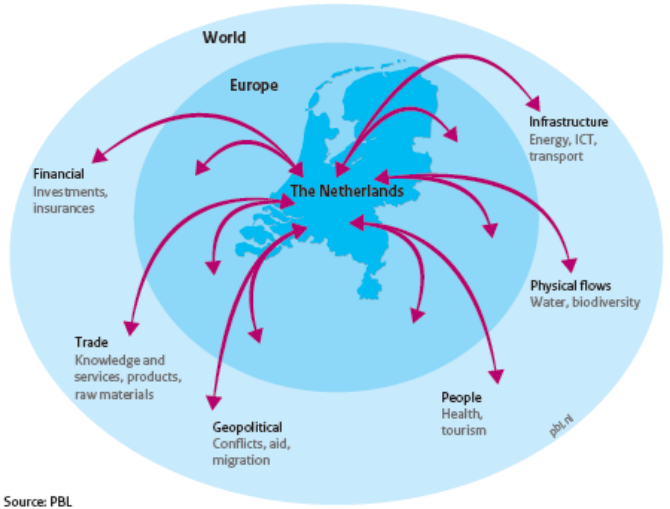
- Trade-oriented economy
  - large importer & exporter
  - 11th largest investor
- Travel a lot, especially throughout Europe
- International dependent infrastructure (esp. ICT, energy)
- Many partner countries in development cooperation are highly vulnerable.

Figure 2.2
International relationships of the Netherlands



Source: Statistics Netherlands; UN Comtrade; OECD; Teleography; Dutch Ministry of Foreign Affairs

Figure 2.1
International relations of the Netherlands



Source: PBL

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Why relevant (ii)

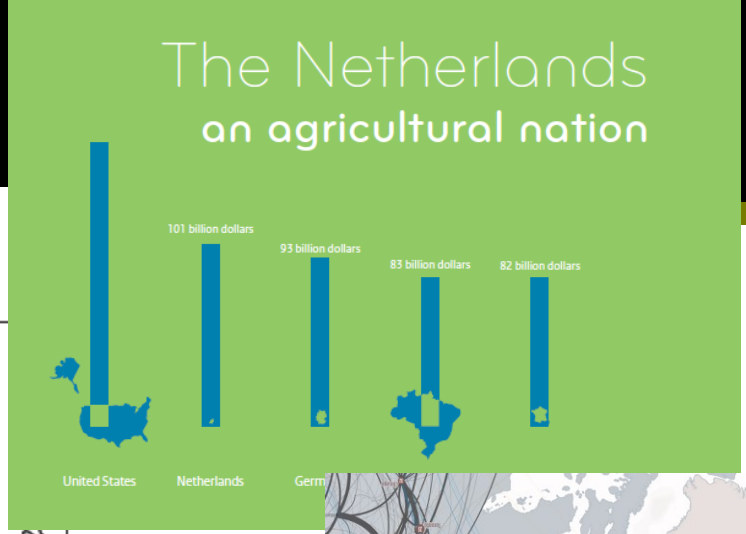
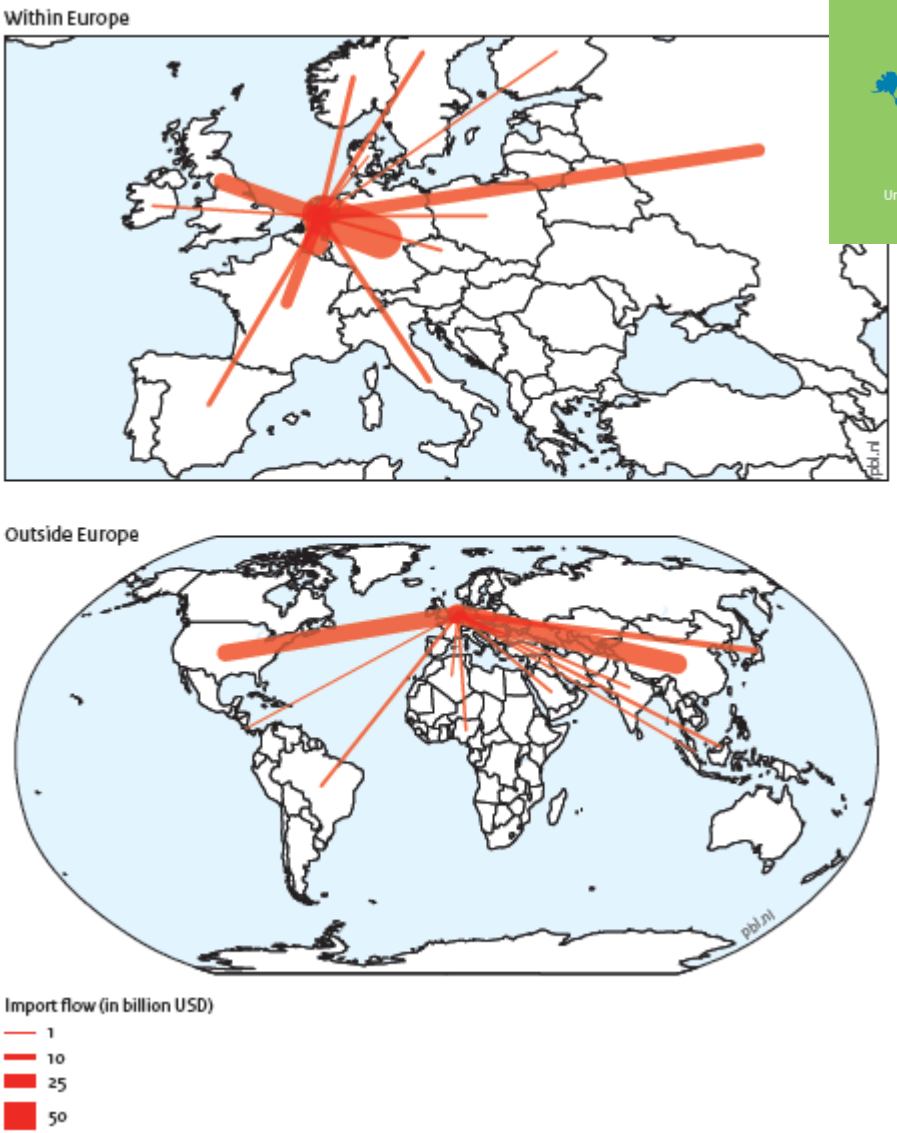


Figure 3.9
Largest import flows to the Netherlands, 2012



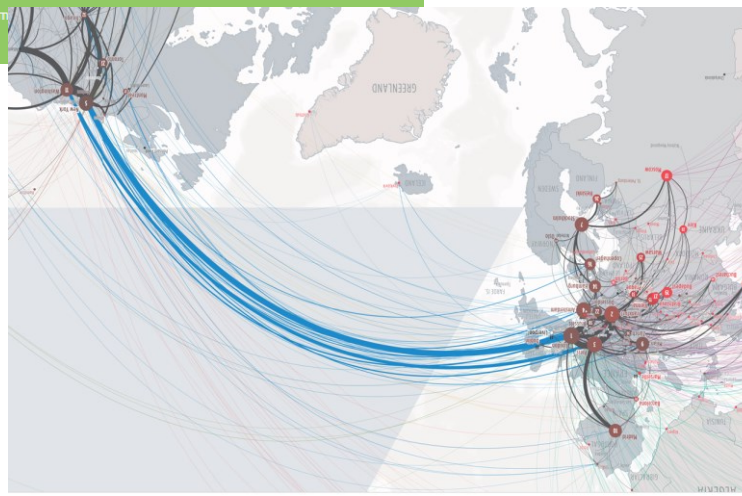
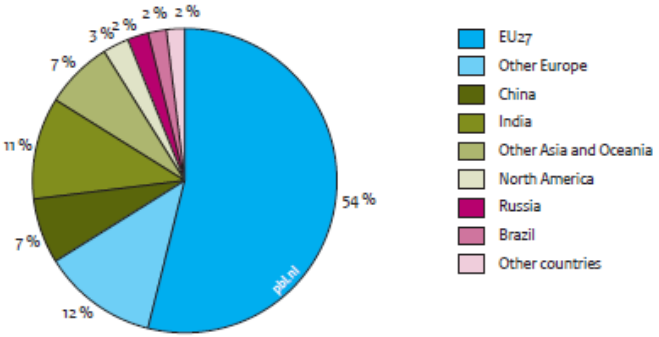


Figure 3.11
Location of international outsourcing, 2009 – 2011



Source: CBS, 2013

Linking to Climate

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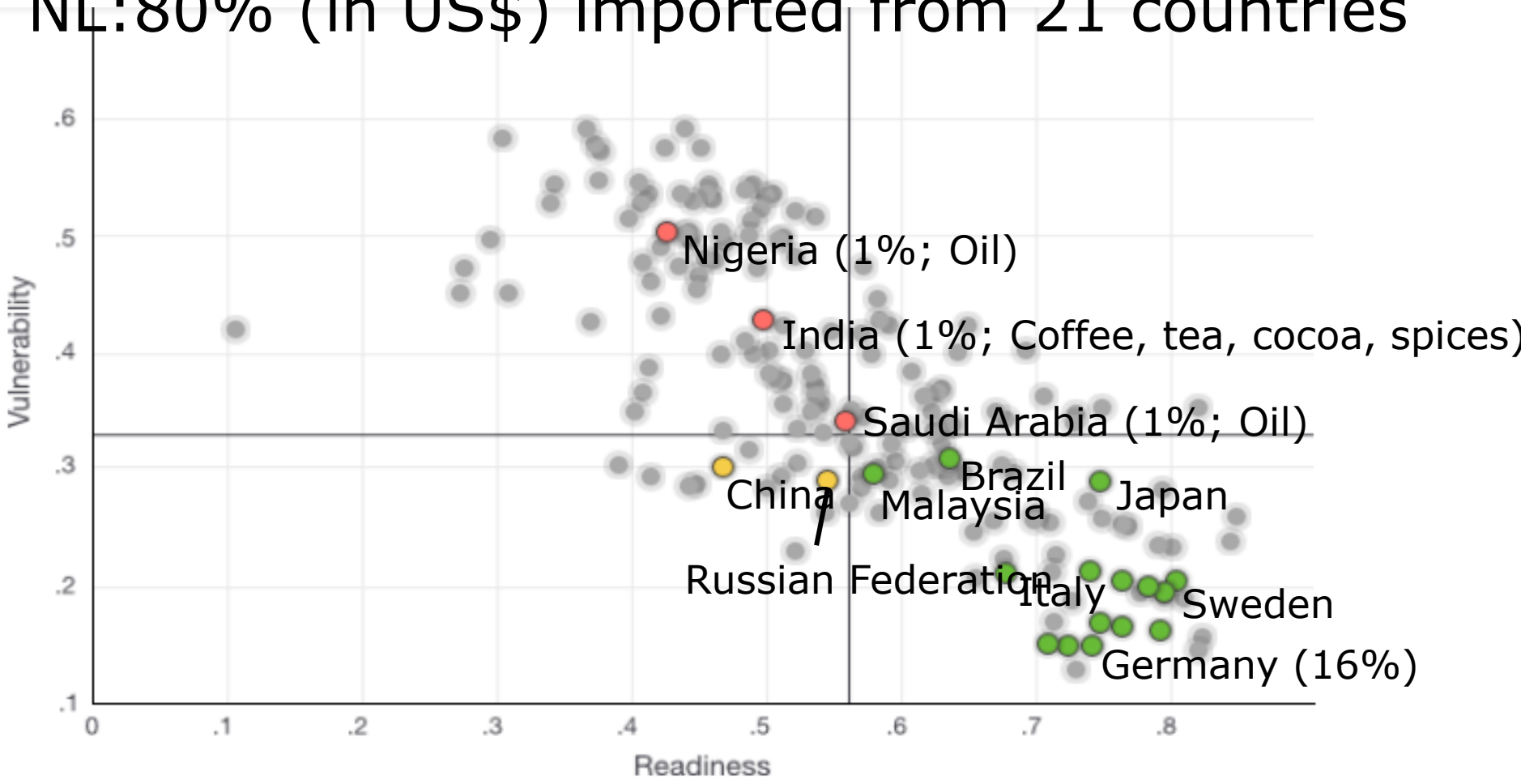
NL:80% (in US$) imported from 21 countries



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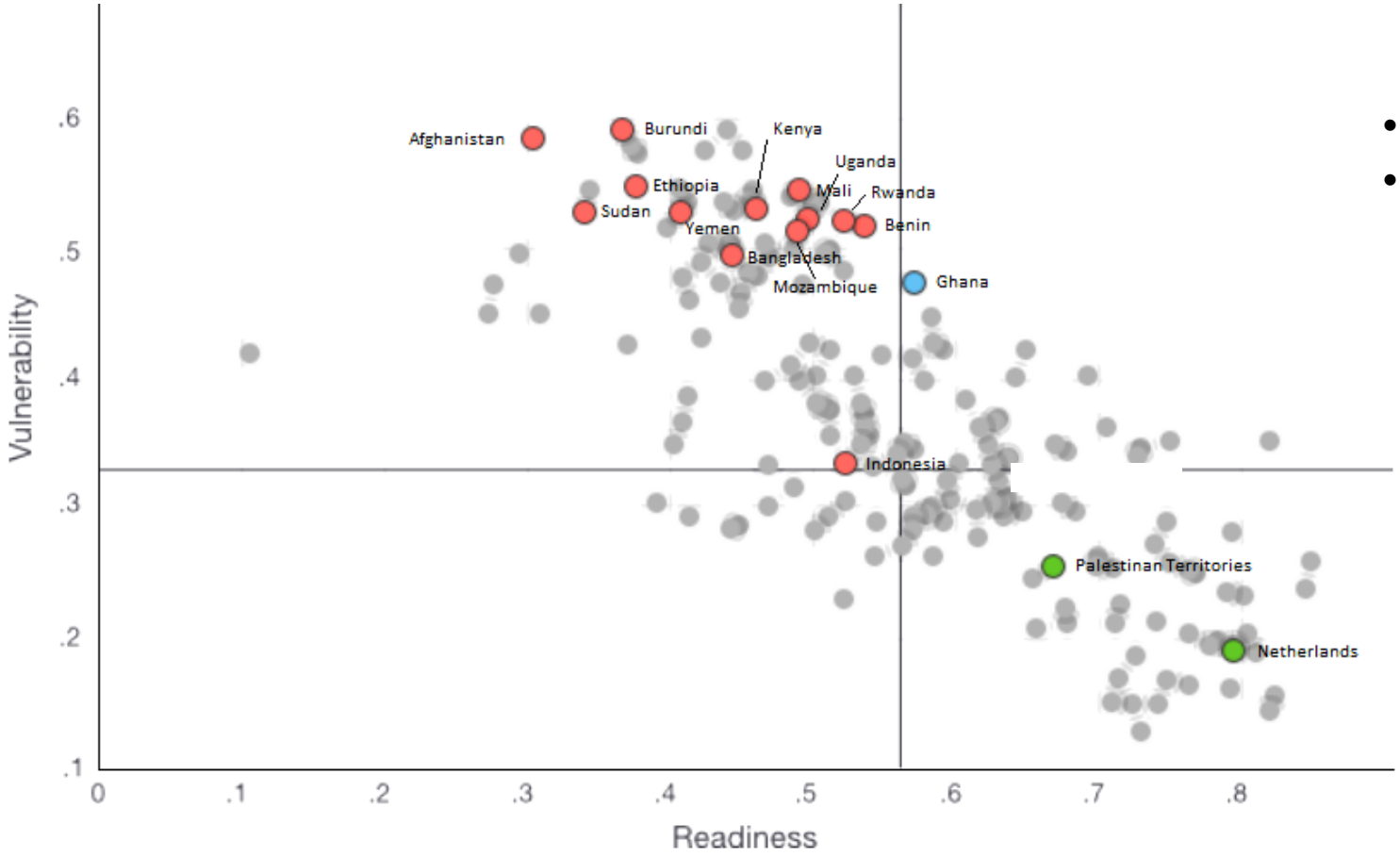
Vulnerability and Readiness of Dutch partner countries



Focus on:

- Food
- Water

Source: Clingendael Institute based on ND-GAIN Index

Linking to Climate(iii)

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Health

- Effects of global extreme weather events on Dutch abroad
- (floods, heatwaves,….)
- Settling of new Infectieus diseases in EU

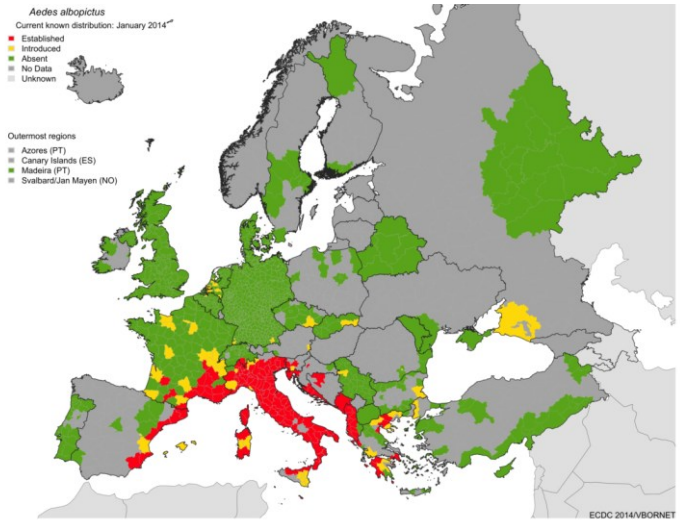

Figure 3.2

Impact of climate change on infectious diseases in Europe

Impact on society	Weak	Moderate	Strong
High		Dengue fever TBE*	Lyme borreliosis*
Medium	Cholera (01 and 0139) Legionellosis Meningococcal infection	Campylobacteriosis **Chikungunya fever*** Cryptospiridiosis Giardiasis Hantavirus **Rift valley fever** Salmonellosis Shigellosis VTEC West Nile fever	**Vibrio spp.** (except V. cholerae 01 and 0139) **Visceral leishmaniasis**
Low	Anthrax Botulism Listeriosis Malaria Q fever Tetanus Toxoplas-mosis	CCHF Hepatits A Leptospirosis Tularaemia Yellow fever Yersiniosis	

Relation to climate change in Europe

In purple : New diseases to be monitored

* : Diseases which are currently subject to a notification requirement in some EU Member States

Source: Lindgren et al. 2012

Summary part 1

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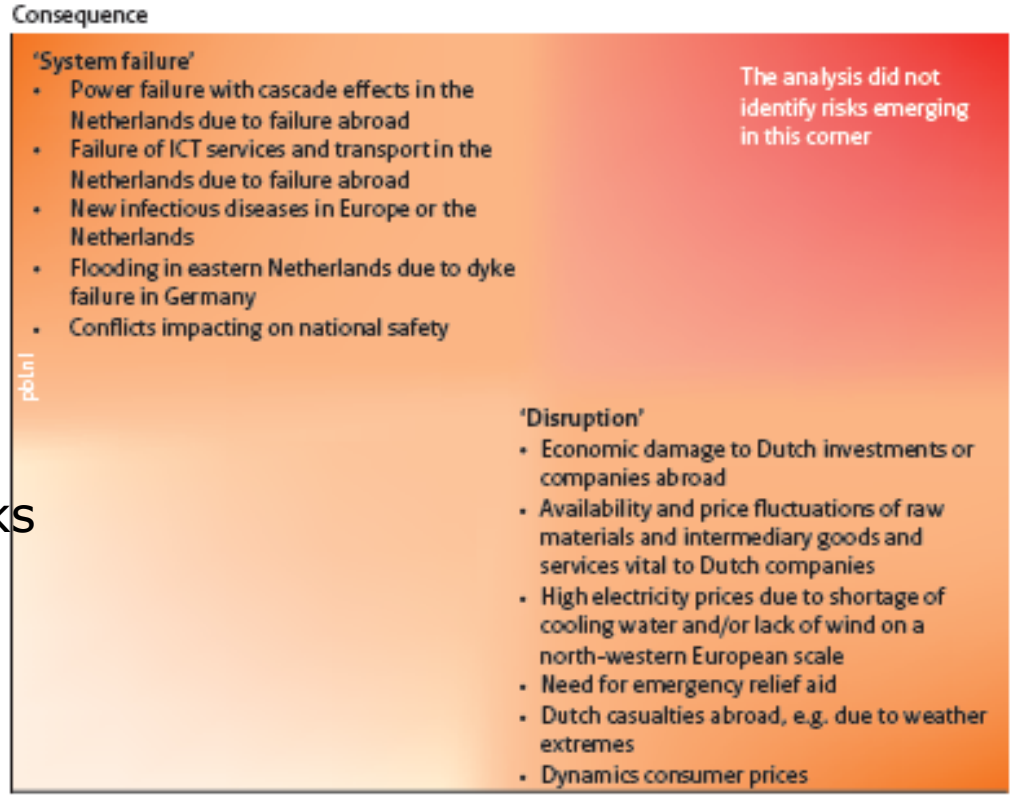
- Climate change abroad is having increasing impacts for the Netherlands
- Not all aspects are equally urgent.

Most important climate risks:

- global context: disruption of economic chains & heighten political tensions

  (Unlikely climate migration will have a direct impact on the Dutch society
- European context: vital networks

- Global Climate adaptation: Major challenges but also relevant to the Netherlands



Source: PBL

For info

www.pbl.nl/en/publications/worldwide-climate-effects-risks-and-opportunities-for-the-netherlands

Part 2

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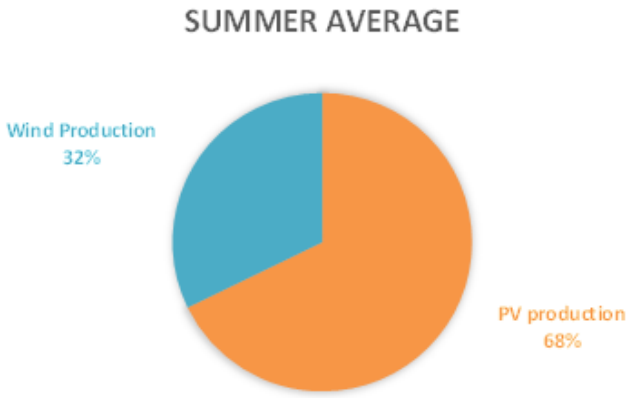
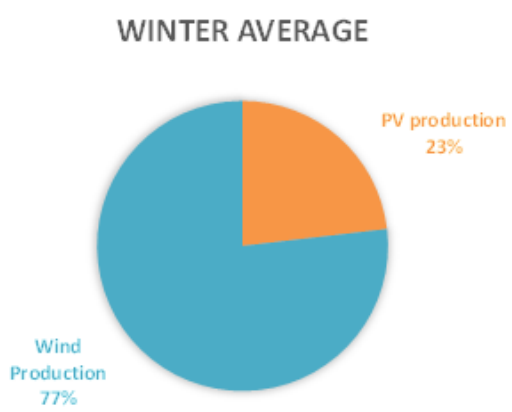
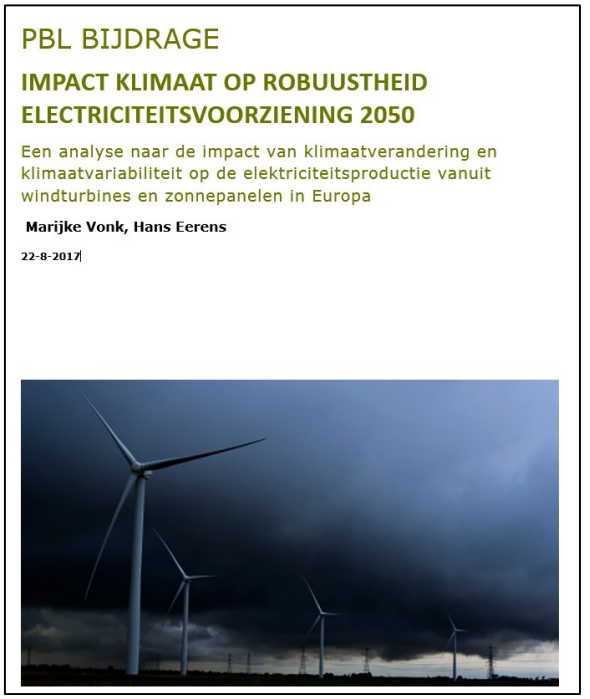
- Stresstest of the Dutch electricity system for climate change & climate variability in Europe
- i.e. Power failure with cascade effects in the Netherlands due to failure abroad
- Case 1: the impact of climate change and climate variability on the wind and solar electricity production
- Compensating wind & PV contribution to Europan enlectricity production







Dutch priority impact

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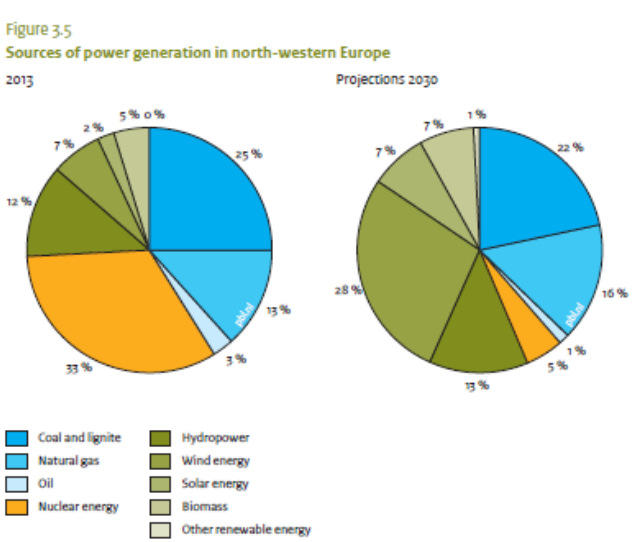
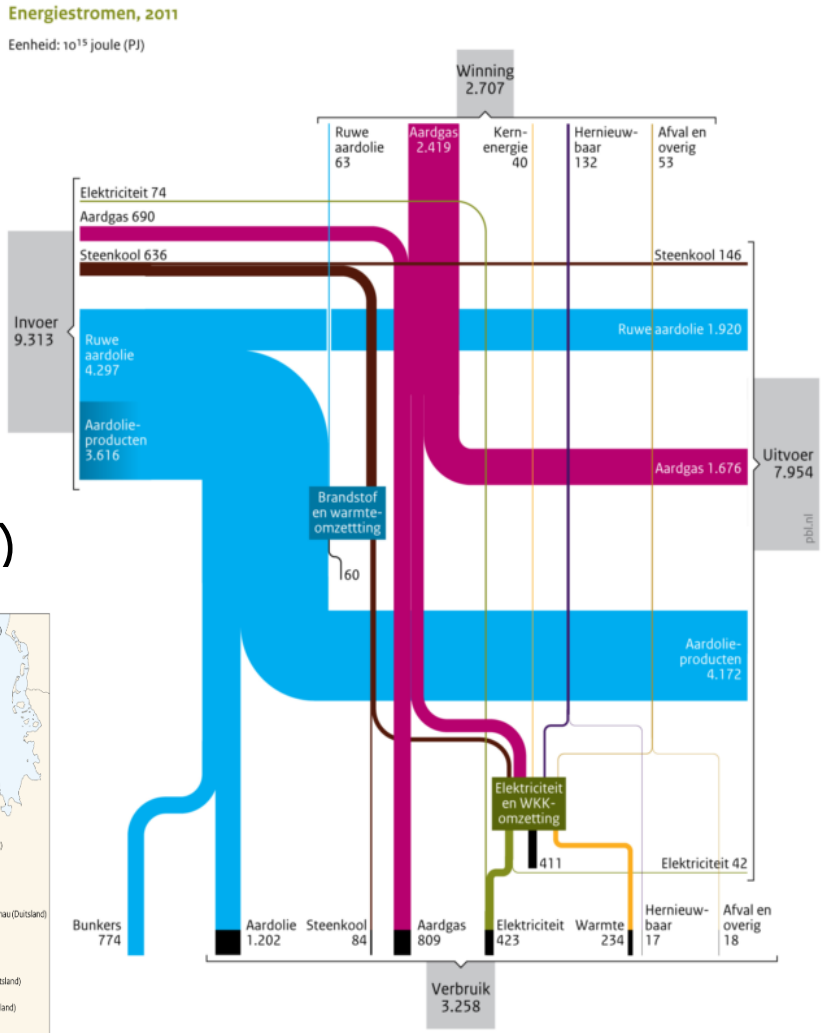
- "low chance, large impact" (economic damage & disruptions)
- International dependency
  - Resources
  - European interconnectivty:
- Increasing role renewables
- More climate extremes

(incl. more periods with no wind & sun)





2017, Zurich

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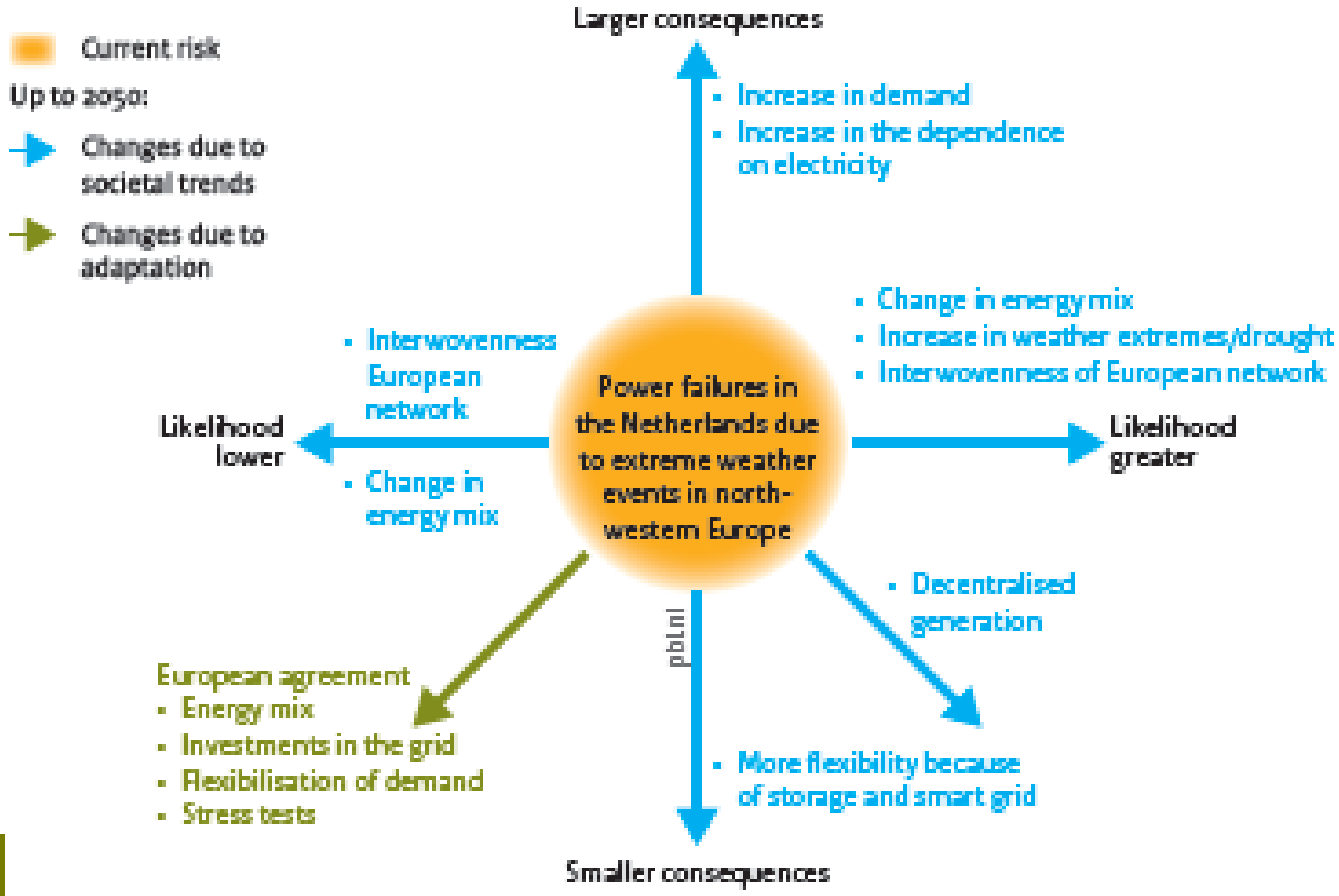
Multiple social & environmental dimensions

Figure 3.3
Forcefield of risk of and adaptation to power failures between now and 2050



e.g. power supply more vulnerable because increase in weather extremes

Source: PBL

Simulations

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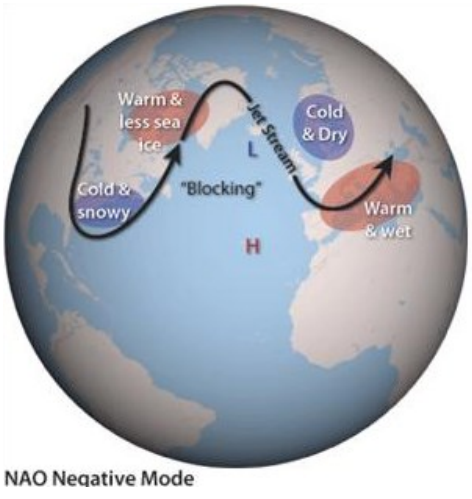
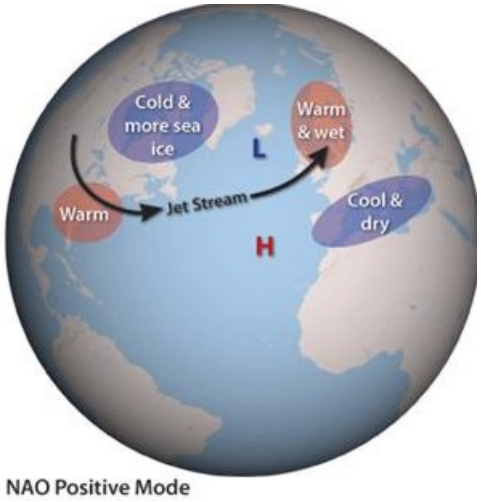
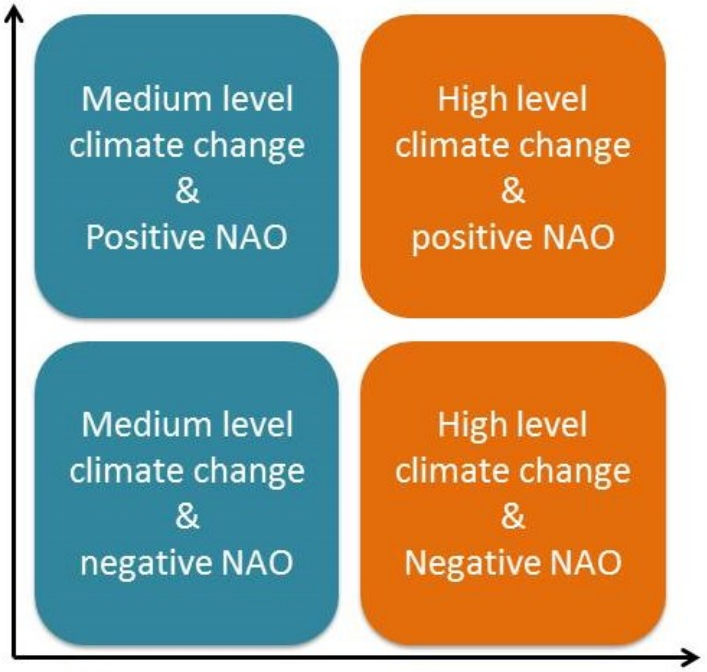
- 4 scenario's voor 2050 with climate change and oscillation (NAO)
- 16 simulations EC-Earth model with 120 year weather data



NAO Negative Mode



NAO Positive Mode



Low wind speed
High HDD

High wind speed
Low HDD

Why NAO

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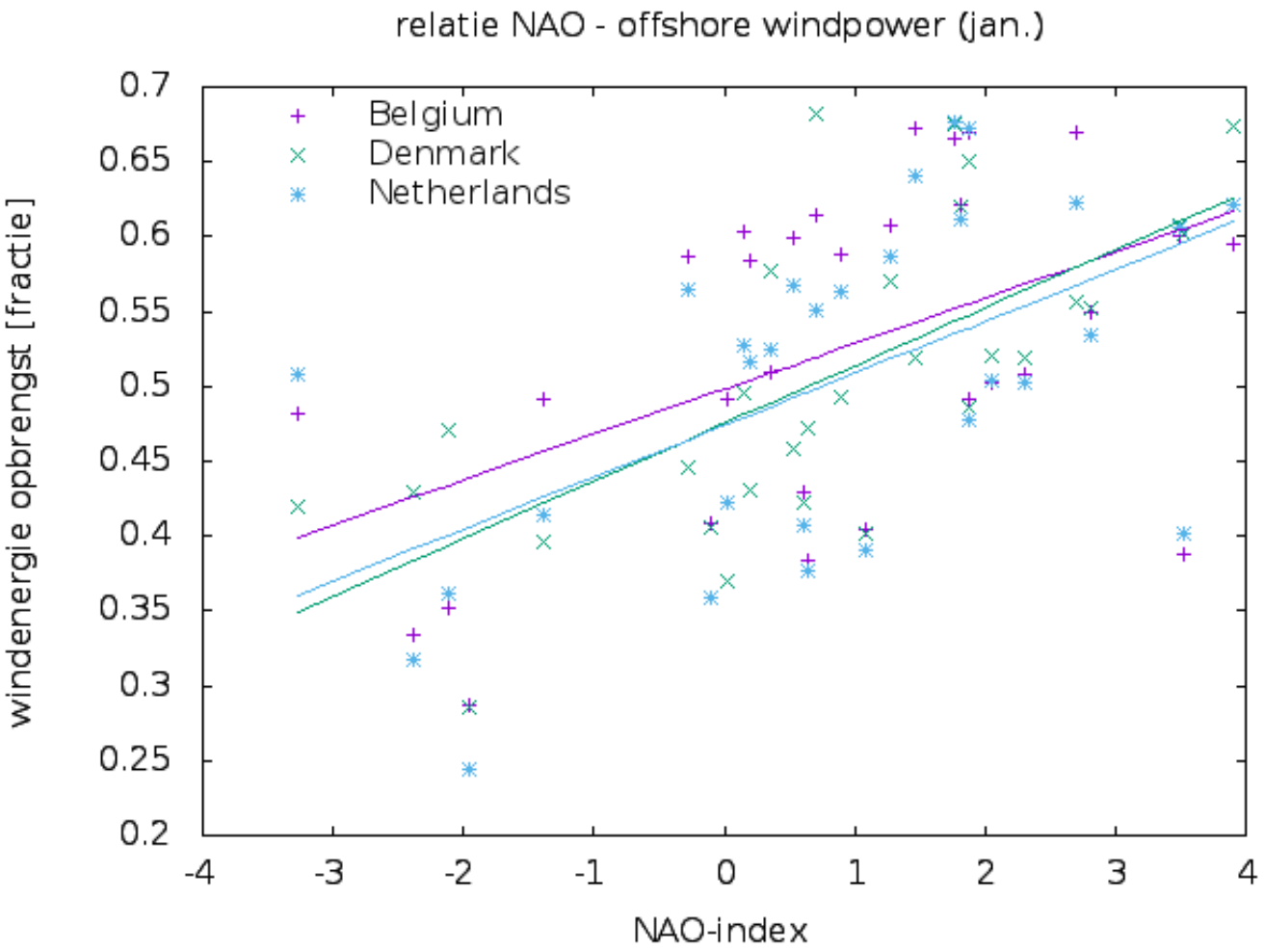

Source: Climatic Research Unit & JRC

Results

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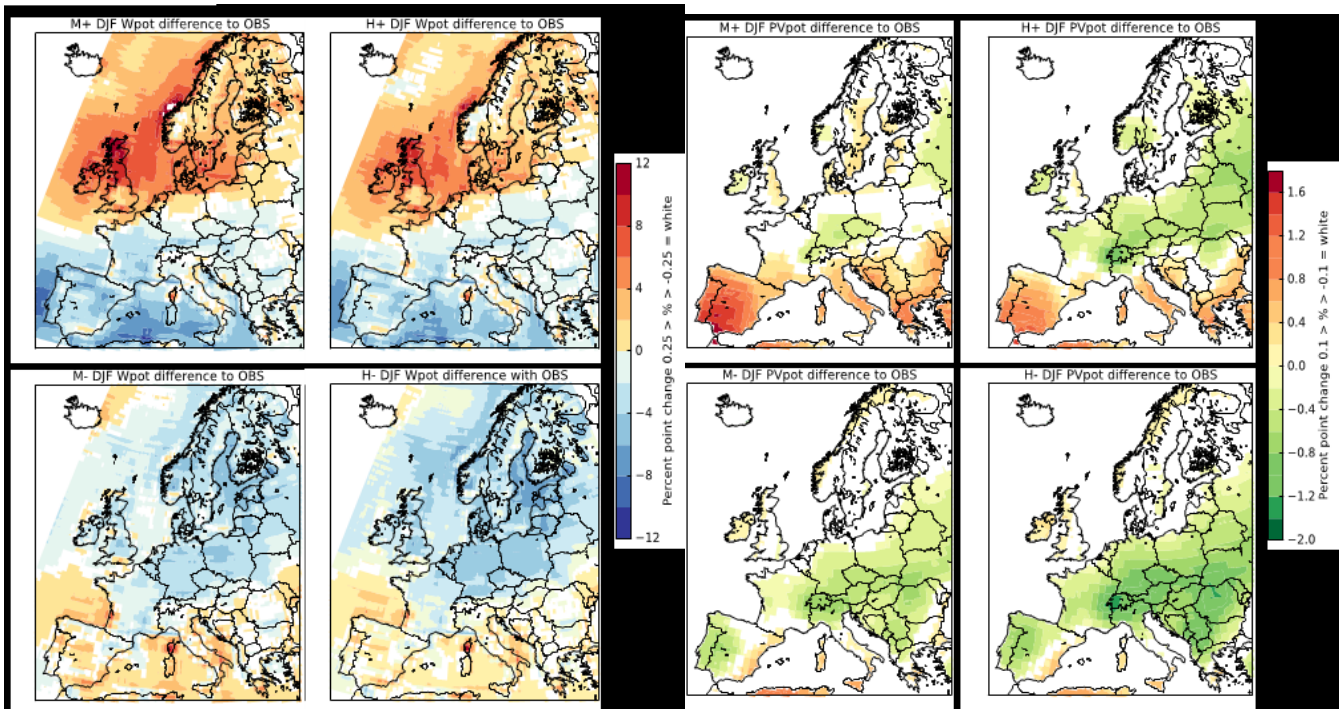
Change in wind (left) and PV (right) power in winter month



- Small effect PV due to CC
- Large effect NOA
- Seasonal difference. Largest effect winter
- Difference across Europe (partial compensation)

Results (ii)

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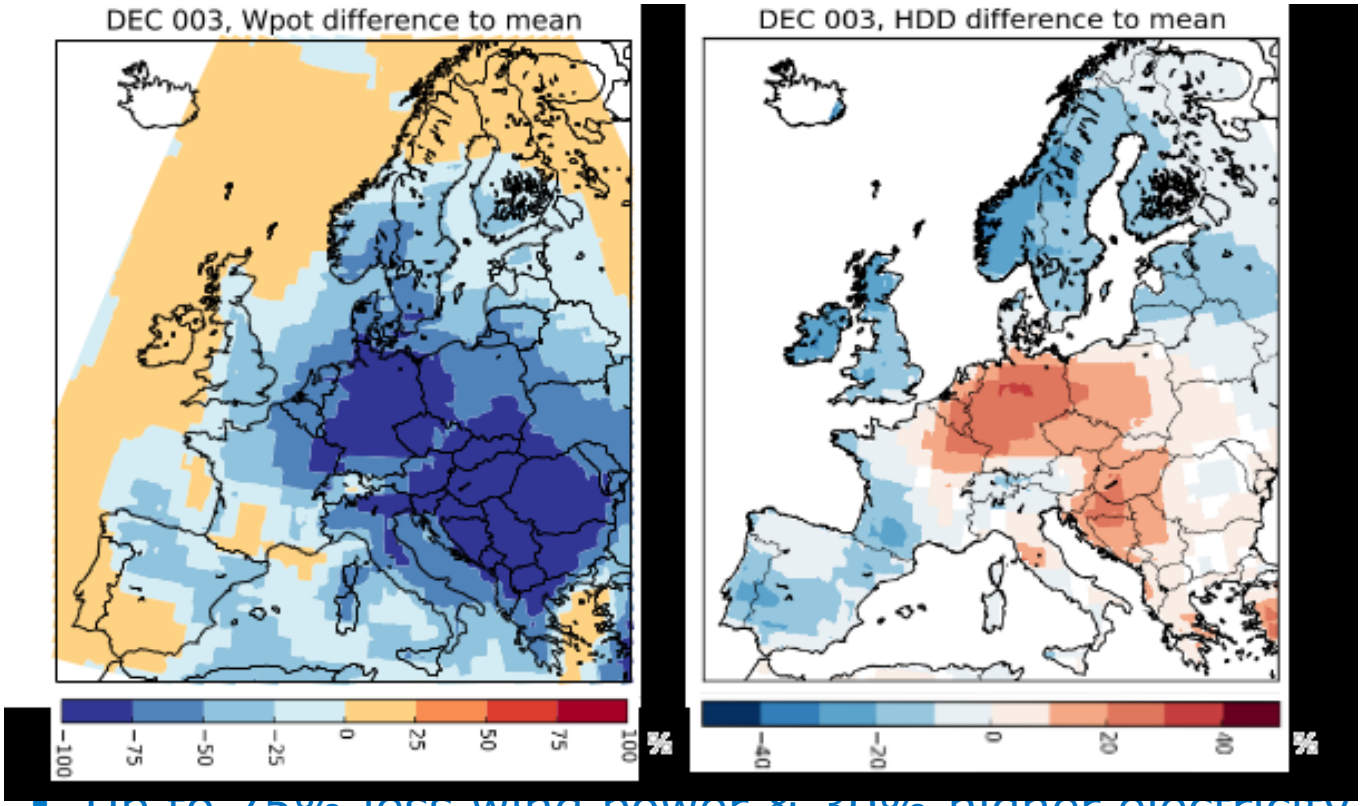
Difference in Wind power en heating requirement for worst winter



- Up to 75% less wind power & 30% higher electricity demand
- In Benelux-Germany region -66%
- Insufficient compensation from PV and more wind elsewhere

Conclusions part 2

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- Stress test shows that electricity production throughtout Europe becomes more vulnerable to combination of climate change and socio-economic developments
- Changes in average climate less threat for wind power and PV
- Climate variability has large effect => Better understanding of NAO needed.
- Increasing robustness for NL through
  - Increasing Cooperation and connectivity between countries (esp. NW Europe)
  - Diversifying energy sources & energy storage (= more flexible system)

Thank you

Questions

www.pbl.nl/en